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INSTALLATION INSTRUCTIONS and TROUBLESHOOTING GUIDE

for the

ANION-ICE MICROMEMBRANE™ SUPPRESSOR
AMMS-ICE, P/N 037107

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INITIAL INSPECTION

As soon as you unpack the Anion-ICE MicroMembrane™ Suppressor, AMMS-ICE, inspect it for shipping damage. Because many carriers limit the claim period to 10 days after the delivery date, DIONEX recommends that you report any shipping damage to the incoming carrier immediately. To request help in assessing shipping damage, or to report a missing or damaged part, contact the nearest DIONEX Regional Office (see Section 9 - DIONEX Regional Offices).

COLUMN WARRANTY

The 90-day column warranty is in effect from the day the Anion-ICE MicroMembrane Suppressor is shipped from DIONEX. After verifying that it was not damaged in transit, install the AMMS-ICE in the system (see the **CAUTION NOTE** in Section 1) and test it by making several injections of the standard used on the test chromatogram that accompanied the specific anion exchange column set that is installed in the system. Check to see that the background conductivity is satisfactory. Contact the nearest DIONEX Regional Office (see Section 9 - DIONEX Regional Offices) if the performance of the AMMS-ICE is unsatisfactory.

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SECTION 1 - INTRODUCTION

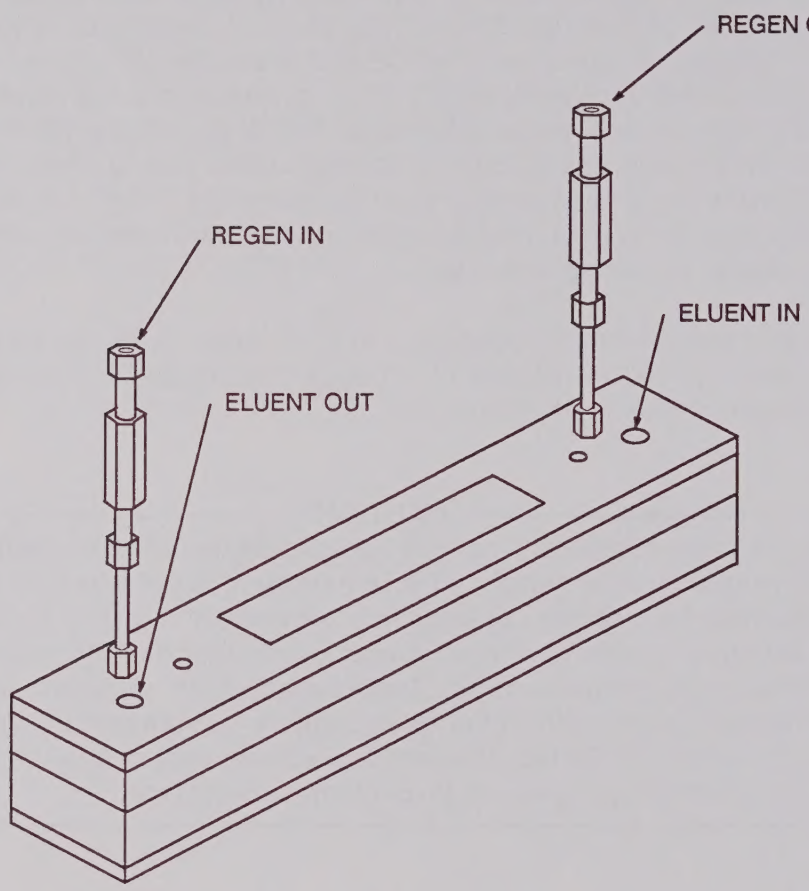
The Anion-ICE MicroMembrane Suppressor (AMMS-ICE) permits continuous operation while adding a minimum of dead volume to the analytical system. As with any suppressor, the primary function of the ICE, or ion chromatography exclusion, suppressor is the reduction of background conductivity. Background conductivity is basically the sum of the specific conductances of the eluent anion and regenerant cation, although deviations caused by concentration effects, temperature, and flow rate may occur. The ICE suppression mode is based on a mechanism which is a reversal of that traditionally seen in the suppression of acidic eluents. Because the eluent is an acid, while the analytes are anionic, the AMMS-ICE removes cations (including the hydronium ion of the eluent), as well as the counterions of the analytes, from the eluent stream. Since the hydronium ion is the main source of conductance, this greatly reduces the background conductivity of the system. In addition, this mechanism forces the ionization of the weak acid analytes, greatly increasing sensitivity.

The AMMS-ICE is also useful for applications in which weak acids, such as fatty acids, are separated by ion suppression and other chromatographic modes. For more information, call the DIONEX Technical Services Hot Line.

CAUTION

The membranes in the AMMS-ICE must be completely hydrated to maintain liquid seals and chromatographic performance. This requirement is achieved by maintaining the regenerant cavities full of the appropriate regenerant solution to ensure that the membranes remain properly hydrated. Occasionally some of the regenerant solution evaporates during long term storage. Before starting an analysis, install your new AMMS-ICE and pump regenerant solution through the suppressor until you see no more bubbles. Let the AMMS-ICE sit for at least 20 minutes to ensure that the membranes are fully hydrated before pumping eluent through the suppressor.

For any problems that may have been encountered in shipping or that are not covered by the appropriate Installation Manuals, additional support can be obtained through any of the DIONEX Regional Offices listed in Section 9.



AMMS-ICE

Figure 1

2.1 SYSTEM REQUIREMENTS

The Anion MicroMembrane Suppressors AMMS-ICE is designed to be run on a Series 2000i, 4000i, DX-100 or DX-300 Ion Chromatograph (IC) equipped with an anion exchange column set and a Conductivity Detector Module (CDM). The AMMS-ICE is installed immediately after the analytical column and before the conductivity detector in the column compartment of the chromatography module.

The MicroMembrane Suppressor Installation Kit (P/N 038018) contains all of the components needed to install and operate the suppressor with pressurized regenerant reservoirs. The kit includes the MicroMembrane Installation Parts Kit (P/N 039055), a 25 psi pressure regulator (P/N 038201), and a four liter regenerant reservoir (P/N 039164).

NOTE

The Cation AutoRegen system cannot be used with ion exclusion chromatography because the result of the suppression reaction in the regenerant stream is water and cannot be regenerated.

During the course of installing and using the AMMS-ICE, it may be necessary to assemble new liquid line fittings. Assembly procedures for various liquid line fittings used with the AMMS-ICE can be found in Section 7.

2.2 ELUENT LINE CONNECTIONS FROM THE ANALYTICAL COLUMN TO THE MICROMEMBRANE SUPPRESSOR AND FROM THE SUPPRESSOR TO THE DETECTOR CELL

NOTE

Refer to Section 6 of this manual if you have an Advanced Chromatography Module (CMA) for installation instructions.

A. Install the Anion-ICE MicroMembrane Suppressor in the first slot inside the Chromatography Module.

B. Use a short piece of PEEK 0.010" ID tubing with a PEEK 10-32 ferrule/bolt fitting on the end of the tubing that will connect to the ELUENT IN port of the AMMS-ICE (see Figure 2). On the other end of this eluent tubing, place a ThermoFlare 1/4-28 fitting or a PEEK 10-32 fitting depending on the outlet end fitting of the analytical column. Connect this end to the outlet end of the analytical column. Refer to Section 7 for

instructions on the assembly of these fittings. To avoid adding dead volume to the system, make the length of all eluent lines as short as practically possible.

C. Use a short piece of PEEK 0.010" ID tubing with a PEEK 10-32 ferrule/bolt fitting on the end of the tubing that will connect to the ELUENT OUT port of the AMMS-ICE (see Figure 2). On the other end of this eluent tubing, place a ThermoFlare 1/4-28 fitting or a PEEK 10-32 fitting depending on the inlet end fitting of the conductivity cell. Connect this end to the inlet end of the conductivity cell. Refer to Section 7 for instructions on the assembly of these fittings. To avoid adding dead volume to the system, make the length of all eluent lines as short as practically possible.

D. Be sure to install a waste line from the conductivity cell that generates approximately 50 psi back pressure. Use the appropiate ID tubing depending on your application requirements. (see Table 1 - Tubing Back Pressures).

TABLE 1

Tubing Back Pressures

Tubing ID (inches)	H_2O Back Pressure at 1 mL/min
0.005	111.4 psi/ft
0.007	29.0 psi/ft
0.010	7.0 psi/ft
0.012	3.4 psi/ft

2.3 REGENERANT LINE CONNECTIONS TO AND FROM THE REGENERANT RESERVOIR

CAUTION

DO NOT disconnect the short pieces of tubing from the REGEN IN and REGEN OUT ports.

NOTE

Refer to the pressurizable plastic reservoir manual (Document No. 032677) for complete installation instructions.

A. Install the AMMS-ICE in the slot inside the chromatography module. Use a coupler (P/N 039056) to connect one end of the 30" tubing assembly (P/N 035727) that comes in the Installation Kit to the regenerant reservoir. Push a slip-on filter (P/N 038260) on the end of the line that goes inside the reservoir. Connect the other end of this tubing

to the short 1/8" OD tubing connected to the REGEN IN port of the AMMS-ICE (see Figure 2).

B. Using a coupler (P/N 034056) and a 1/8" OD piece of tubing that comes in the Installation Kit, connect one end of this line to the short 1/8" OD tubing connected to the REGEN OUT port of the AMMS-ICE (see Figure 2). Direct the other end of the line to waste.

C. Install a restrictor to the regenerant flow by connecting a piece of 0.012" ID tubing to the end of the waste line that is approximately 12" long.

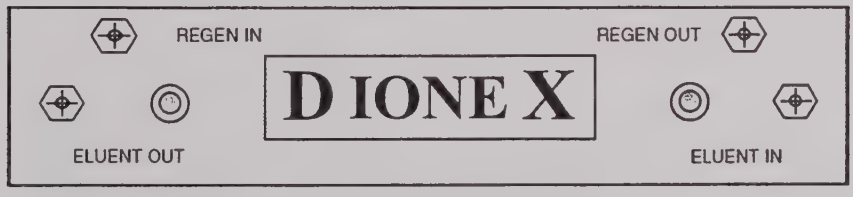
D. Install the regulator (P/N 038201) on the helium or nitrogen supply line. The regenerant flow rate is regulated by two factors: the pressure applied to the regenerant reservoir and the length of the 0.012" ID tubing connected to the waste line.

E. Prepare the regenerant. Fill the regenerant reservoir. Make sure that the O-ring is inside the cap of the reservoir before screwing the cap onto the reservoir. Screw the cap onto the reservoir tightly and place the reservoir near the Chromatography Module. Refer to Section 3.2.

F. Adjust the reservoir pressure (0-25 psi) to deliver the desired flow rate. Refer to Section 3.2.

NOTE

A safety relief valve on the reservoir regulator prevents pressure greater than 25 psi from being applied to the regenerant reservoir.



AMMS-ICE

Figure 2

Eluent and Regenerant Line Connections to the AMMS-ICE

3.1 CHEMICALS REQUIRED

Obtaining precise and accurate results requires eluents that are free of ionic impurities. Chemicals and deionized water used to prepare eluents must be of the highest purity available. Low trace impurities and low particulate levels in eluents and regenerants also help protect your expensive Anion-ICE MicroMembrane Suppressors, AMMS-ICE, and system components from contamination. DIONEX cannot guarantee proper column performance when the quality of the chemicals and water used to prepare eluents has been compromised.

Reagent Grade inorganic chemicals should always be used to prepare ionic eluents. Whenever possible, inorganic chemicals that meet or surpass the latest American Chemical Society standard for purity (universally accepted standard for reagents) should be used. These inorganic chemicals will detail the purity by having an actual lot analysis on each label.

The deionized water used to prepare eluents should be Type I Reagent Grade Water with a specific resistance of 17.8 megohm-cm or greater. The deionized water should be free of ionized impurities, organics, microorganisms and particulate matter larger than 0.2 mm. Bottled HPLC-Grade Water should not be used since most bottled water contains an unacceptable level of ionic impurities. Finally, thoroughly degas all deionized water prior to preparing any eluents or regenerants.

For ease of regenerant preparation and guaranteed purity, use DIONEX Cation Regenerant Solution (tetrabutylammonium hydroxide (TBAOH), P/N 039602). Tetrabutylammonium hydroxide (TBAOH) is the recommended regenerant for use with the Anion-ICE MicroMembrane Suppressor (AMMS-ICE).

3.2 DETERMINING ELUENT AND REGENERANT CONCENTRATIONS

A. Unlike conventional suppressor columns, which entail periodic shutdowns for regeneration, the AMMS-ICE has the ability to provide continuous suppression.

B. The operation of the AMMS-ICE requires a constant flow of the regenerant over the membrane, in a direction that is countercurrent to the flow of the eluent. A standard regenerant flow rate of 2 mL/min is recommended. This flow rate is adequate for most applications. For applications that require stronger than typical eluent strengths, the regenerant flow rate may be increased up to a maximum of 5 mL/min.

C. The AMMS-ICE is compatible with acetonitrile, methanol, and isopropanol. The maximum solvent level is 90%. For more information about solvent compatibility, call the DIONEX Technical Services Hotline.

NOTE

Do not use solvents such as THF or ethanol in the eluent.

D. 5 mM tetrabutylammonium hydroxide (TBAOH) is the recommended regenerant for use with the Anion-ICE MicroMembrane Suppressor (AMMS-ICE). Potassium hydroxide or tetramethylammonium hydroxide may be used as alternate regenerants, but cause higher background conductivity and therefore compromise total system performance. For ease of preparation and guaranteed purity, use DIONEX Cation Regenerant Solution (P/N 039602).

E. For the best signal to noise ratio and overall performance, DIONEX recommends that the Cation Regenerant Solution (P/N 039602) be pressurized with nitrogen or helium. If air is used, replace the regenerant solution at least every three (3) days because the regenerant absorbs carbon dioxide from the air.

NOTE

Use nitrogen or helium to pressurize the Regenerant Reservoir.

SECTION 4 - TROUBLESHOOTING GUIDE

The purpose of the Troubleshooting Guide is to help you solve operating problems that may arise while using the Anion-ICE MicroMembrane Suppressors, AMMS-ICE. For more information on problems that originate with the Ion Chromatograph or the specific anion exchange column set in use, refer to the Troubleshooting Guide in the appropriate Installation Manual. If you cannot solve the problem on your own, contact the nearest DIONEX Regional Office (see Section 9).

4.1 HIGH BACKGROUND CONDUCTIVITY

A. Check that the regenerant is flowing from the waste line at the proper flow rate.

1. If there is no flow from the waste line, disconnect the 0.012" ID tubing connected to the waste line. If the regenerant lines and the suppressor are filled with regenerant and there are no restrictions in the regenerant line, the regenerant should flow freely from the 1/8" OD waste line. If there is no flow, make sure the reservoir cap is tight and that there are no audible air leaks. Also make sure that the regenerant reservoir is pressurized. If it is, trace the regenerant lines backward from the reservoir to find and remove any blockage.

2. If there is flow from the waste line, but it is less than the desired flow rate, increase the flow rate by shortening the 0.012" ID waste line tubing or by increasing the reservoir pressure. If the flow rate is correct, go on to the next step.

3. If the regenerant is flowing at the desired rate, either the selected regenerant flow rate is too slow or the regenerant is too dilute to suppress the eluent concentration at the set eluent flow rate. Increase the regenerant flow rate or increase the regenerant concentration. Most applications require 10 mM TBAOH regenerant or less.

B. Check for eluent flow out of the suppressor ELUENT OUT port.

1. If there is no flow out of the AMMS-ICE ELUENT OUT port, make sure that eluent is entering the suppressor at the ELUENT IN port. If there is no flow at this point, trace the eluent flow path backward through the system to find and remove the blockage.

2. If there is flow into the AMMS-ICE, but not out, and there are no visible leaks from the side seam of the suppressor, a break in the membrane is probably allowing eluent to leak into the regenerant. If this is the case, then the AMMS-ICE must be replaced.

DO NOT DISASSEMBLE
THE ANION-ICE MICROMEMBRANE SUPPRESSOR.

3. If there is flow from the ELUENT OUT port, but no eluent suppression, the membrane may have been contaminated. Try to restore system performance by cleaning the membrane (see Section 5).

C. Remake the regenerant to be sure that the concentration is correct and that the solution has been freshly prepared. Be sure that chemicals of the required purity were used to make the regenerant (see Section 3.1). If the regenerant concentration is too high or too old, it can cause high background conductivity. DIONEX recommends the use of DIONEX Cation Regenerant Concentrate (P/N 039602) for the best performance.

D. Remake the eluent to be sure that the concentration is correct. Be sure that chemicals of the required purity were used to make the eluent (see Section 3.1). If the eluent concentration is too high, the AMMS-ICE will not be able to suppress it, resulting in high background conductivity.

E. If the background conductivity remains high, and you cannot solve the problem on your own, contact the DIONEX Regional Office nearest you (see Section 9).

4.2 DRIFTING BASELINE

A. Increase the regenerant flow rate by shorting the 0.012" ID restrictor line on the regenerant waste line or by increasing the pressure on the reservoir.

B. Remake the regenerant to be sure that the concentration is correct and that the solution has been freshly prepared. Be sure that chemicals of the required purity were used to make the regenerant (see Section 3.1). If the regenerant has absorbed carbon dioxide from the air, it can cause a drifting baseline.

C. Clean the suppressor membrane by flushing 0.1 M boric acid through the regenerant chamber at 2.0 mL/min. for 10 minutes.

4.3 DECREASED SENSITIVITY

A. Check for leaks throughout the system. If a fitting is leaking, tighten it carefully until the leak stops.

B. Ensure that the injection valve is operating correctly. Refer to the valve manuals that accompany the chromatography module for troubleshooting assistance. Be sure to check the slider port faces for damage.

C. Check the regenerant flow rate. If the flow rate has decreased from the selected setting, reset it to the initial conditions.

D. If sensitivity remains low, clean the membrane (see Section 5).

E. If cleaning the membrane does not restore sensitivity, the AMMS-ICE may need to be replaced.

F. If you cannot solve the problem on your own, contact the DIONEX Regional Office nearest you (see Section 9).

4.4 SYSTEM BACK PRESSURE INCREASES OVER TIME

A. If the increased back pressure does not affect system performance, no maintenance is necessary.

B. The most common cause of increasing system back pressure is a contaminated frit in the analytical or guard column inlet end fitting. Before doing anything else, check the inlet frits on these columns and replace them if necessary. The complete instructions for replacing column bed support assemblies are in Document No. 032285. Recheck the system back pressure. If it remains high, go on to the next step.

C. Bypass the AMMS-ICE by coupling the ELUENT IN and ELUENT OUT eluent lines. If the back pressure decreases by less than 150 psi with the AMMS-ICE out of line, a blockage in the system is causing the high pressure. Find and eliminate the blockage.

D. If the back pressure decreases by more than 150 psi with the AMMS-ICE out of line, the high pressure is caused by a blockage in the AMMS-ICE. Reverse the direction of flow of both the eluent and the regenerant through the AMMS-ICE. Do not connect the line between the cell and the AMMS-ICE. If this inverted operation decreases the back pressure, reconnect the AMMS-ICE to the cell and use it in this position.

E. If reversing the flow through the AMMS-ICE does not decrease the pressure, clean the membrane (see Section 5).

F. If cleaning the membrane does not reduce the pressure, the AMMS-ICE must be replaced.

G. If you cannot solve the problem on your own, contact the DIONEX Regional Office nearest you (see Section 9).

4.5 LIQUID LEAKS

A. If there is leakage between the cover and body of the AMMS-ICE, carefully tighten the fittings in the ELUENT and REGEN IN and OUT ports (see Figure 2). If tightening the fittings does not stop the leak, replace them.

B. If there is leakage from the side seam of the AMMS-ICE, check the system back pressure.

1. If the back pressure is less than 100 psi with only the AMMS-ICE in-line, the AMMS-ICE is defective and must be replaced. Do not disassemble the AMMS-ICE and attempt to repair it yourself.

2. If the back pressure is greater than 100 psi, the leaks are caused by excessive back pressure downstream from the AMMS-ICE. Find and eliminate the source of the pressure.

SECTION 5 - ANION-ICE MICROMEMBRANE SUPPRESSOR CLEANUP

This section describes routine cleanup procedures for the Anion-ICE MicroMembrane Suppressors, AMMS-ICE, in the case of contamination. Consult the Troubleshooting Guide (see Section 4) to first determine that the system is operating properly. If the AMMS-ICE is determined to be the source of higher than normal back pressure, higher than anticipated conductivity, decreased suppression capacity or decreased sensitivity, cleaning the membrane may restore the performance of the system. Use the following procedures to clean the membrane.

5.1 ORGANIC CONTAMINANTS OR PRECIPITATES

A. Disconnect the analytical (and guard) column(s) from the injection valve and the AMMS-ICE. Refer to the specific analytical column Installation Instructions and Troubleshooting Guide for column cleanup procedures.

B. Turn off the regenerant and disconnect the regenerant line from the AMMS-ICE REGEN IN port.

C. Disconnect the liquid line from the AMMS-ICE ELUENT OUT port to the cell at the cell and reconnect it to the REGEN IN port.

D. Connect a container of 90% acetonitrile or methanol in deionized water to the Eluent #4 panel fitting on the Analytical Pump (APM or GPM). Pump this solution through the AMMS-ICE at 1-2 mL/min. for 30 minutes.

E. Flush the columns and the AMMS-ICE separately with deionized water for 10 minutes.

F. Reinstall the analytical (and guard) column(s). Begin pumping eluent through the system at the flow rate required for your analysis and equilibrate the system.

SECTION 6 - INSTALLATION INSTRUCTIONS WITH AN ADVANCED CHROMATOGRAPHY MODULE (CMA)

In some models of the Advanced Chromatography Module (CMA), Valve A has been removed from the eluent flow path and ports 1 through 4 of Valve B have been plumbed to provide on/off control of the regenerant flow from the MicroMembrane Suppressors. Use Figure 3 to familiarize yourself with the MicroMembrane Suppressor's flow schematic when using pressurized regenerant reservoirs with a CMA.

A. Check the valve compartment of your Chromatography Module. If Valve A is plumbed into the eluent flow path (i.e., if the chromatography module is set up for in-line regeneration of a packed bed suppressor), replumb it before beginning operation (see Section 6.1). If replumbing is not necessary, proceed with the following instructions.

B. Make the eluent line connections from the analytical column and to the detector as described in Section 2.2.

C. Make the following regenerant line connections:

1. Using a coupler (P/N 039056), connect the end of the 1/8" OD tubing installed in Port 2 of Valve B to the tubing extending from the REGEN OUT port of the AMMS-ICE (see Figure 2).

2. Connect a 12" piece of 1/8" OD tubing to the back of panel bulkhead fitting #4 on the Chromatography Module. Using a coupler (P/N 039056), connect the other end of this tubing to the REGEN IN port of the AMMS-ICE (see Figure 2).

3. Use a coupler (P/N 039056) to connect one end of the 30" tubing assembly (P/N 035727) that comes in the Installation Kit to the regenerant reservoir. Push a slip-on filter (P/N 038260) on the end of the line that goes inside the reservoir. Connect the other end of this tubing to the front of the Chromatography Module in panel bulkhead fitting #4. Be sure that the connection is to the desired system.

D. Prepare the regenerant. Fill the regenerant reservoir. Make sure that the O-ring is inside the cap of the reservoir before screwing the cap onto the reservoir. Screw the cap onto the reservoir tightly and place the reservoir near the Chromatography Module.

E. Press the Valve B on/off switch on the Chromatography Module front panel to turn on the helium or nitrogen supply for the regenerant reservoir. Adjust the reservoir pressure (0 - 25 psi) to deliver the desired flow rate. Refer to Section 3.2.

NOTE

A safety relief valve on the reservoir regulator prevents pressure greater than 25 psi from being applied to the regenerant reservoir.

F. Once you determine the reservoir pressure required to deliver the desired flow rate, you will probably not need to change the pressure regulator setting. The regulator can be left at the correct pressure setting and the flow of gas to the reservoir can be turned on and off using Valve B on the Chromatography Module.

6.1 REPLUMBING THE CHROMATOGRAPHY MODULE

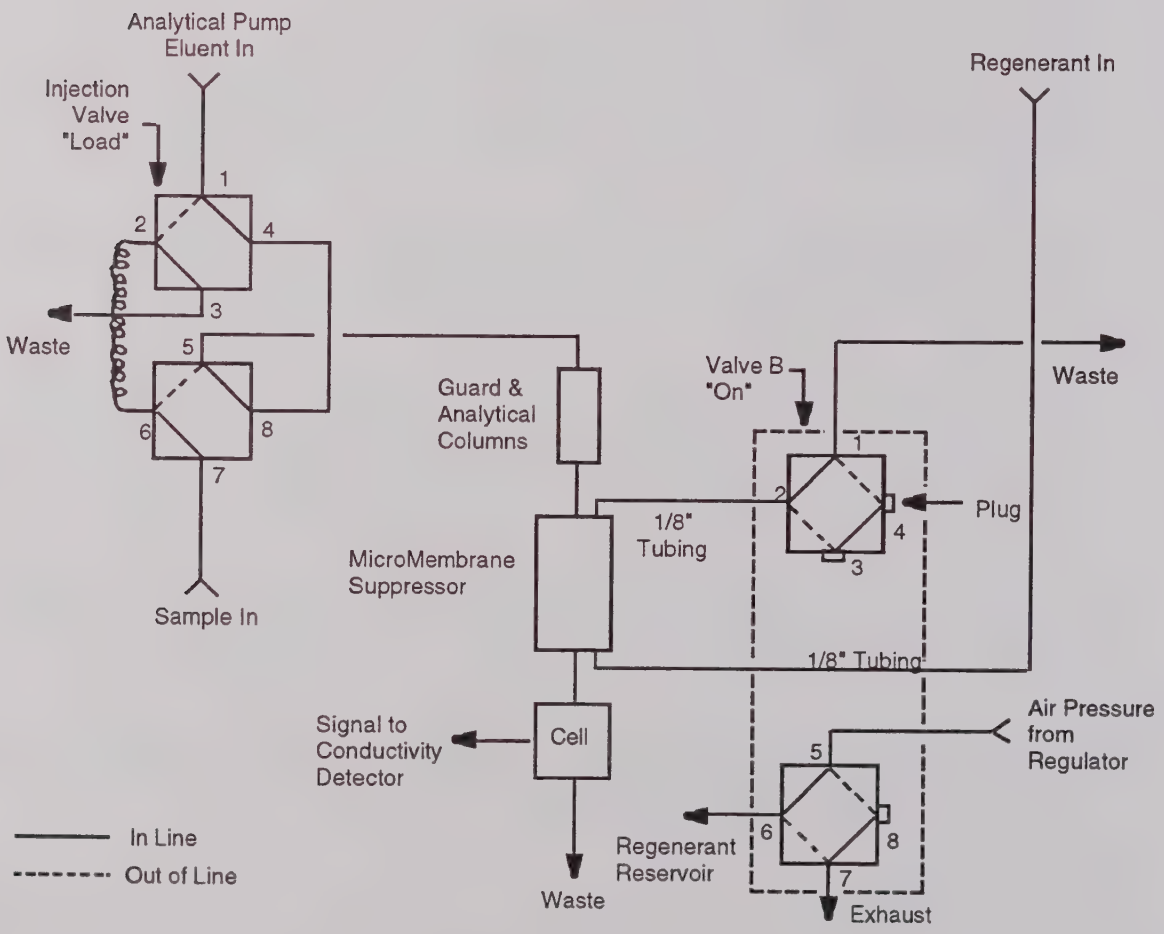


Figure 3

Replumbing the Chromatography Module

A. The following procedure removes Valve A from the eluent flow path and modifies the eluent flow path so that the eluent flows directly from the injection valve through the guard and analytical column and then through the AMMS-ICE (see Figure 3). Since the MicroMembrane Suppressor does not require routine in-line regeneration like a packed bed suppressor, Valve A is not required and its removal decreases system dead volume which increases overall system performance.

1. Open the door of the Chromatography Module valve compartment.

2. Disconnect the liquid line from Port #1 of the injection valve (see Figure 3-3 in the Advanced Chromatography Module manual, Document No. 032127).

3. Disconnect the liquid line from Port #1 of Valve A and reconnect it to Port #1 of the injection valve.

4. Disconnect the liquid line from Port #3 of Valve A. This line goes to the conductivity cell inlet and should be reconnected directly to the ELUENT OUT port of the AMMS-ICE.

B. Ports #5 through #8 of Valve B provide on and off control of the gas that pressures the regenerant reservoir. Nitrogen, helium or air may be used. Nitrogen or helium afford the best performance when working at high sensitivities. The following procedure describes how to connect Ports #5 through #8 of Valve B to the gas supply and to the regenerant reservoir.

1. Wrap the threads of each of two barbed air fittings (P/N 030077) with about two turns of Teflonr plumber's tape. Screw the fittings into Ports #5 and #6 of Valve B (see Figure 3).

2. Push one end of a length of tinted 1/8" OD plastic tubing (P/N 030089) over the barbed fitting in Port #5. Connect the other end of the tubing to the regulator on the supply of nitrogen, helium or air.

3. Push one end of a second length of 1/8" OD tubing over the barbed fitting in Port #6. Push the other end of the tubing over the barbed fitting on the regenerant reservoir.

4. Screw a plug (P/N 037628) into Port #8 of Valve B.

C. Ports 1 through 4 of Valve B are used for on/off control of the regenerant from the suppressor. This prevents siphoning or gravity feed of the regenerant through the suppressor when it is not in use.

NOTE

If Valve B in your Advanced Chromatography Module (CMA) has already been plumbed to control the regenerant flow, ignore this section and simply connect the regenerant reservoir to the panel bulkhead fitting #4 of the CMA system that you plan to use. See the CMA Operator's Manual (Document No. 032127) for details.

1. Push one spacer (P/N 024453) into Port #1 of Valve B.

2. Connect one end of a long piece of 1/8" OD tubing (P/N 035728) with fittings on both ends to Port #1 of Valve B (see Figure 3).

3. Using a coupler (P/N 039056), connect a 6" piece of 0.012" ID tubing (P/N 035548) to the end of the 1/8" OD tubing. Direct the assembled tube out the rear of the CMA to a waste container.

4. Push one spacer (P/N 024453) into the Port #2 pressure bolt of Valve B.

5. Connect a 12" piece of 1/8" OD tubing (P/N 035936) with fittings on both ends to Port #2 of Valve B.

6. Install plugs (P/N 037628) in Ports #3 and #4 of Valve B.

SECTION 7 - INSTALLATION OF DIONEX LIQUID LINE FITTINGS

7.1 LIQUID LINE CONVERSION BETWEEN 10-32 AND 1/4-28 FITTINGS

During the course of installing and using the Anion-ICE MicroMembrane Suppressor, it may be necessary to obtain a transition liquid line for use between the 10-32 eluent ports on the Anion-ICE MicroMembrane Suppressor and a component that requires a 1/4-28 liquid line fitting. PEEK tubing, ferrules and bolts should be used for all liquid line connections between 10-32 ports. A Tefzel transition liquid line with a PEEK 10-32 fitting on one end and a 1/4-28 ThermoFlare fitting on the other end can be used in applications with or without solvent where the tubing is not subject to pressures over 2,000 psi. The following Tefzel transition liquid lines can be obtained from DIONEX:

P/N	Description
043780	Tefzel liquid line, 0.007" ID x 12" long with one 10-32 and one 1/4-28 fitting
043781	Tefzel liquid line, 0.012" ID x 12" long with one 10-32 and one 1/4-28 fitting

Reposition the 10-32 threaded fitting bolt (P/N 043275) and a double-cone ferrule (P/N 043276) on the line to make the length of the line between components in the eluent flow path as short as possible.

7.2 ASSEMBLY AND INSTALLATION OF 10-32 PEEK FERRULE/BOLT FITTINGS

The DIONEX Ferrule Fitting System consists of a length of 1/16" OD tubing, a 10-32 threaded tapered port, a HPLC 10-32 threaded fitting bolt (P/N 043275) and a double-cone ferrule (P/N 043276). The fitting is intended to be installed into a 10-32 threaded, tapered port as shown in Figure 4 - 10-32 PEEK Ferrule Fitting System, below. The bolt and ferrule are fabricated from high-strength PEEK plastic which conforms to a relatively large range of port geometries but works most reliably in the DIONEX 10-32 PEEK ports. The DIONEX Ferrule Fitting System can be used on any semi-rigid tubing such as Tefzel or rigid tubing such as PEEK or stainless steel tubing with an outside diameter of 0.062". Although stainless steel tubing can be used, it should be avoided because it can damage PEEK ports if the bolt/ferrule assemblies are not properly made and because it will introduce metals into the analytical flow path. As is true for all of the liquid lines in the eluent flow path, an internal diameter of 0.012" or less is required (0.010" or 0.005" ID PEEK tubing should be used on 10-32 columns and components).

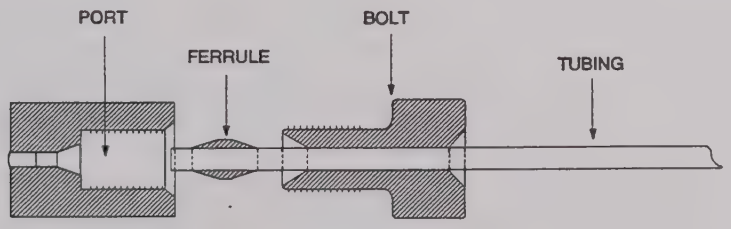


Figure 4

10-32 PEEK Ferrule Fitting System

The following procedure is used to install the 10-32 PEEK bolt and ferrule fittings on liquid lines. For the most reliable performance, DIONEX recommends the use of PEEK tubing whenever liquid lines with 10-32 fittings are required. Whenever a transition liquid line to a component with a 1/4-28 fitting is required, a Tefzel transition liquid line with a PEEK 10-32 ferrule/bolt fitting on one end and a 1/4-28 ThermoFlare fitting on the other end can be used.

A. The PEEK tubing provided by DIONEX has a 0.062" OD which is important so that the ferrule fits snugly on the tubing and thus makes a good seal. In situations where Tefzel tubing will be used, the PEEK bolt and ferrule do not easily slide onto Tefzel tubing when making a transition liquid line, a short section of the Tefzel tubing should be stretched slightly to reduce its diameter (see Figure 5 for details on assembling a Tefzel transition liquid line with a PEEK bolt and ferrule).

B. Slide the end of the tubing through the hex-end of the PEEK bolt and then through the ferrule. The ferrule is symmetrical and can be pushed onto the tubing through either end.

C. Pull the tubing through the 10-32 PEEK bolt and the ferrule until the ferrule fits snugly on a section of the PEEK tubing or if Tefzel tubing is used, pull the ferrule onto the unstretched section of Tefzel tubing.

D. Cut the tubing off at least 1/8" past the end of the ferrule. Make sure that the end is cut off carefully at a right angle to the length of the tubing and that there are no nicks or burrs on the end of the tubing. Being careful while making liquid line fittings will reduce dead volumes and band broadening. This is important for maximum system performance.

E. Place the tubing with the ferrule and the 10-32 PEEK bolt into the 10-32 port and push the tubing through the bolt until it fits snugly against the bottom of the port. Making sure that there is no gap between the end of the tubing and the bottom of the port will ensure low dead volumes and minimal band broadening. This is important for maximum system performance.

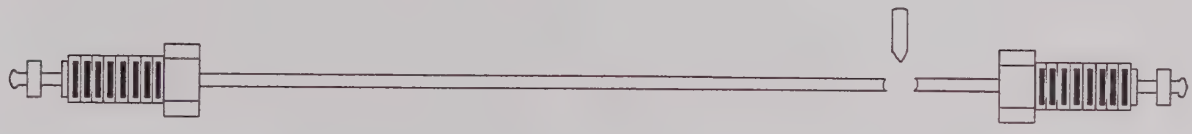
CAUTION

Tighten the 10-32 PEEK bolt by hand until it is fingertight. As the bolt is tightened further, the ferrule will compress tightly around the tubing. In the case of Tefzel tubing, the compression of the ferrule will also compress the semi-rigid Tefzel tubing. Overtightening the bolts can reduce the ID of Tefzel tubing until flow through the tubing is completely restricted. Severe overtightening of the bolt in all cases can damage the mating surfaces of the 10-32 port. Fingertight torquing of the liquid line bolts provides leak free operation up to 3,000 psi.

F. For the best performance, end fittings should be mated to ports. Once a ferrule has been compressed inside a particular 10-32 port, it can be removed and reinstalled in the same port without sacrificing performance. If a liquid line needs to be routed to a new port, a new ferrule should be mounted on the end of the line and compressed in the new port to form a mated ferrule/port pair. This ensures the best sealing properties.

Tefzel Tubing with two 1/4-28 ThermoFlare/bolt assemblies

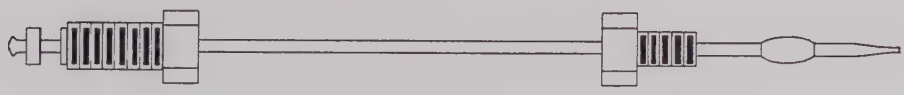
Step 1: Cut the tubing with a razor blade.



Step 2: Stretch the tubing only if it does not slip through the ferrule.

Step 3: Cut the tubing at the smallest diameter in the stretched region.

Step 4: Slip a 10-32 PEEK bolt and ferrule on the stretched tubing and then pull them PAST the stretched section of tubing.



Step 5: Cut the tubing perpendicular to its axis and approximately 1/8" from ferrule. Remove ALL of the stretched tubing!

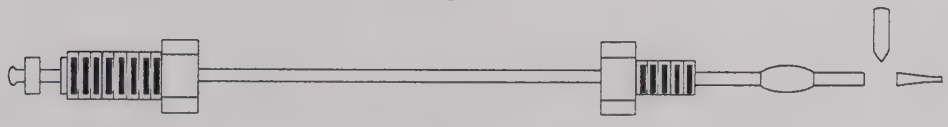


Figure 5

Tighten the 10-32 ferrule/bolt assembly fingertight ONLY.
Overtightening will constrict the Tefzel tubing

7.3 ASSEMBLY AND INSTALLATION OF THERMOFLARE FITTINGS (ON TEFZEL TUBING ONLY)

If you already have a short connecting liquid line with ThermoFlare fittings on both ends for use between components with 1/4-28 ThermoFlare end fittings, you may choose to cut off one of the 1/4-28 ThermoFlare end fittings with a razor blade and replace it with a 10-32 PEEK ferrule/bolt assembly, as described in Section 7.2 - Assembly and Installation of 10-32 PEEK Ferrule/Bolt Fittings .

If you choose to assemble new Tefzel lines with 1/4-28 end fittings, the sealing surface of the 1/4-28 ThermoFlare fitting is made by first heating and then flaring the end of the tubing with a special flaring tool (120 VAC version, P/N 037196 or 230 VAC version, P/N 037197). Complete instructions for using the tool are in Document No. 032843.

If you prefer not to buy a flaring tool, liquid lines designed for use in the eluent flow path with factory-made ThermoFlares are available from DIONEX in the following lengths:

P/N	Description
039335	Tefzel line, 0.012" ID x 4" long with two 1/4-28 fittings
039336	Tefzel line, 0.012" ID x 8" long with two 1/4-28 fittings
039337	Tefzel line, 0.012" ID x 12" long with two 1/4-28 fittings
039338	Tefzel line, 0.012" ID x 24" long with two 1/4-28 fittings

Column Accessories

043780	Tefzel line, 0.007" ID x 12" long with one 10-32 and one 1/4-28 fitting
043781	Tefzel line, 0.012" ID x 12" long with one 10-32 and one 1/4-28 fitting
039335	Tefzel line, 0.012" ID x 4" long with two 1/4-28 fittings
039336	Tefzel line, 0.012" ID x 8" long with two 1/4-28 fittings
039337	Tefzel line, 0.012" ID x 12" long with two 1/4-28 fittings
039338	Tefzel line, 0.012" ID x 24" long with two 1/4-28 fittings
042690	PEEK Tubing, 0.010" ID x 0.062" OD
044221	PEEK Tubing, 0.005" ID x 0.062" OD
043275	Bolt, Double Cone Ferrule Fitting, 10-32 (PEEK)
043276	Double Cone Ferrule, 10-32 (PEEK), ea
043225	Double Cone Ferrule, 10-32 (PEEK), pkg of 10
042772	Plug, Ferrule Fitting, 10-32 (PEEK), ea
042806	Union, Black PEEK 10-32 ferrule to 1/4-28 ThermoFlare Tefzel Line
039296	Union, 1/4-28 to 1/4-28, 0.020" ID
039056	Union, 1/4-28 to 1/4-28, 0.062" ID
037196	ThermoFlare Tool (115 V)
037197	ThermoFlare Tool (230 V)
041620	ThermoFlare Tubing Kit
039302	ThermoFlare Washers

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